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(56) Documents cited

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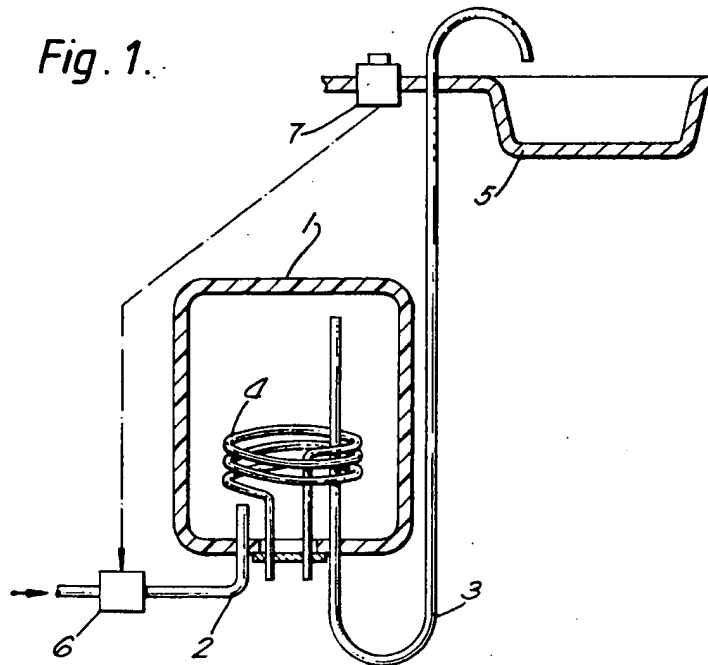
(58) Field of search

F4A

## (54) Electric water heaters

(57) An electric water heater, especially for undersink use, is provided with an on-off valve 6 controlling the passage of water into a container housing an electric heating element 4, and is associated with control means 7 located, for example, above the sink for operating the valve remotely, the outlet pipe from the container being always open.

Fig. 1.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

Fig. 1.

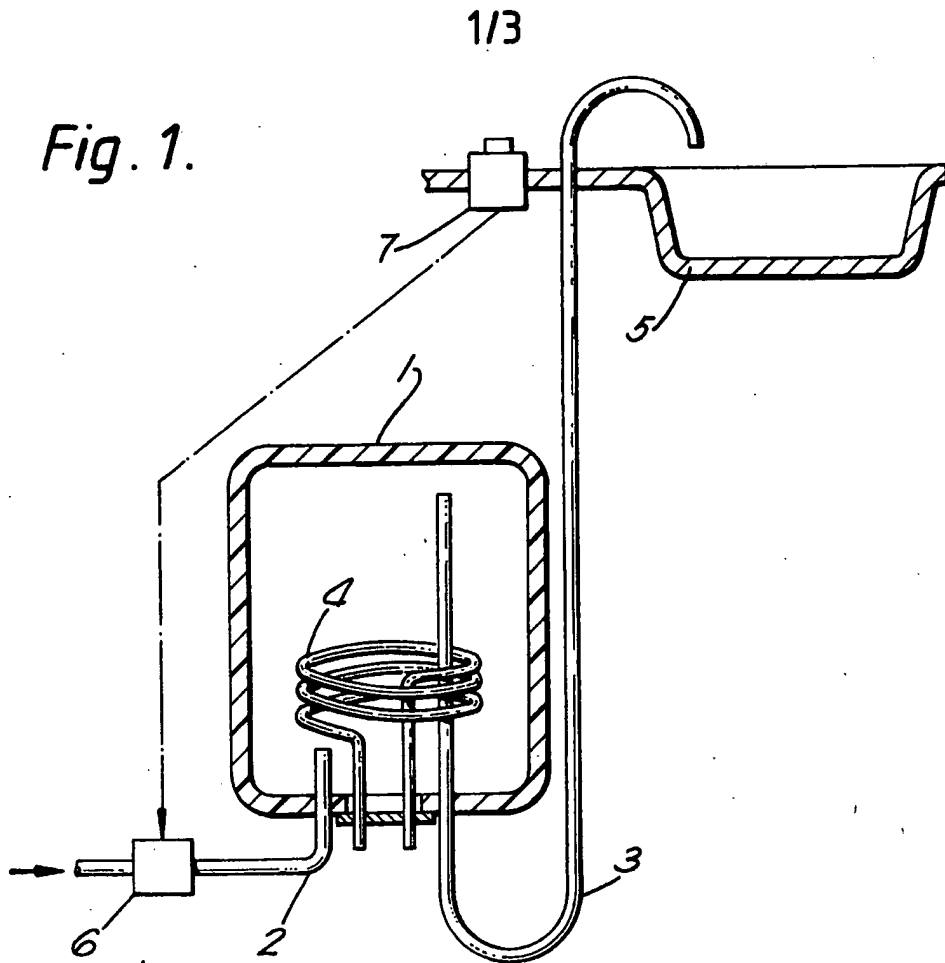


Fig. 2.

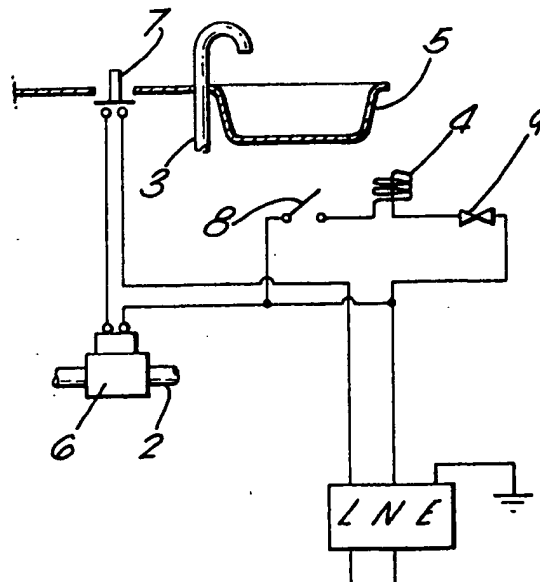


Fig. 3.

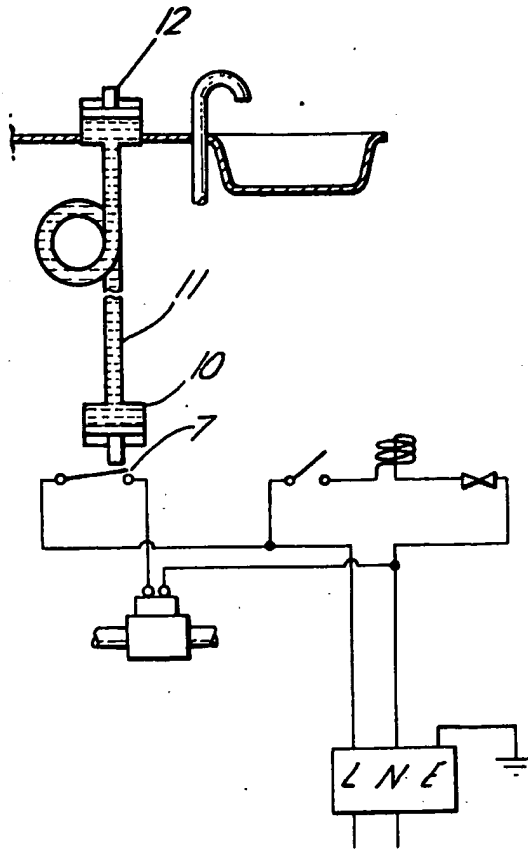
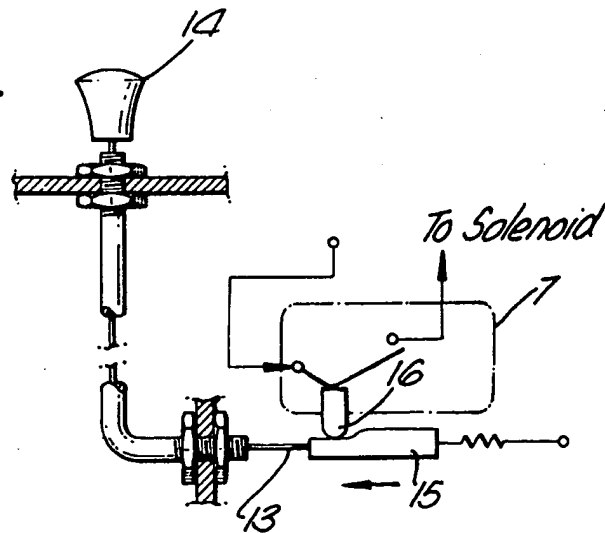


Fig. 4.



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Fig. 5.

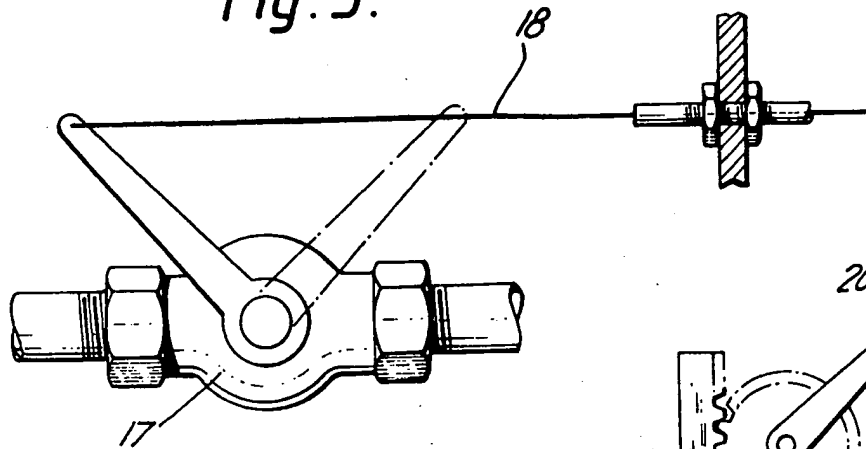


Fig. 6.

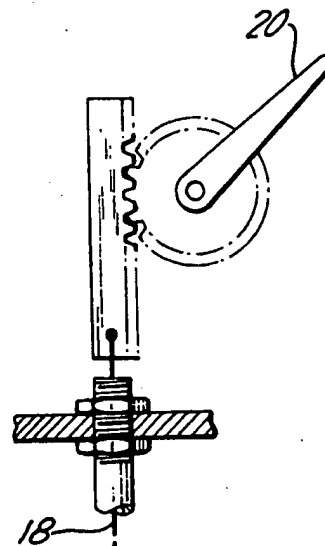
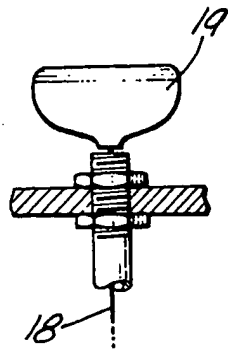
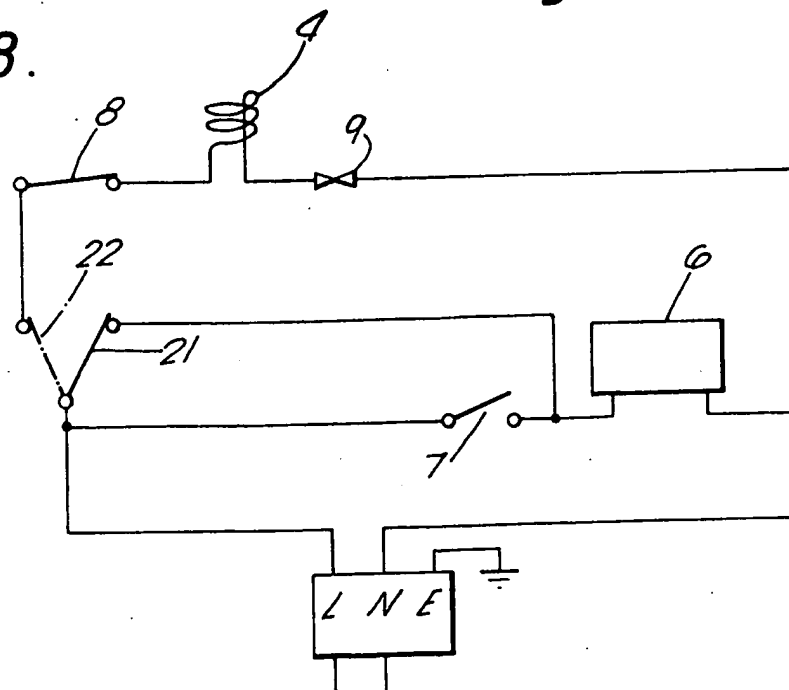


Fig. 7.

Fig. 8.



## SPECIFICATION

## Electric water heaters

5 This invention relates to electric water heaters of the kind comprising a container in which is located a sheathed wire electric heating element, an outlet pipe extending to an upper part of the container, in inlet pipe arranged to  
10 feed water into a lower part of the container, and means associated with the inlet pipe for controlling the passage of water through the container, the outlet pipe being always open.

Commonly such heaters are disposed above  
15 a sink, and the control means in such a case is usually in the form of a tap as it is readily accessible to users. It is not, however, always convenient to mount the heater above the sink, but the installation of a heater of this  
20 kind beneath a sink poses problems. Thus it is clearly inconvenient to place the control adjacent the container, as is customary with over-sink heaters, and the provision of a tap which is controllable from above the sink has given  
25 rise to difficulties, apart from being expensive.

According to the invention an electric water heater of the kind referred to, suitable for installation beneath a sink, incorporates an on-off valve controlling the passage of water  
30 into the container through the inlet pipe, and control means for operating the valve remotely.

The expression "on-off valve" means a valve which has a comparatively simple movement for allowing or preventing the passage  
35 of water through the inlet pipe, as opposed to a tap requiring rotation through 180° or more for controlling the flow of water.

The use of an on-off valve is advantageous  
40 in that remote control can be effected in a variety of ways depending upon the form of valve employed, and manual control means can readily be located so as to be readily accessible, for example above the sink in the  
45 case of an undersink heater.

The valve may, for example, comprise a solenoid valve operated by a switch which may either be mounted on the sink top, or be itself located adjacent the valve and arranged  
50 to be operated remotely, either pneumatically, mechanically or hydraulically.

Alternatively the valve may be operable directly by pneumatic, mechanical or hydraulic means.

55 In order to prevent overheating it is necessary that the container should be filled on installation, at least to cover the heating element, before the latter is energised. However in the case of heaters in accordance with the invention in which the valve is an electrically-operated solenoid valve, it is clearly necessary  
60 to energise the valve in order to allow the container to be filled. Accordingly in order to avoid the risk of the heating element being  
65 prematurely energised on installation, a fur-

ther switch is conveniently provided which, in one position, completes a current path in parallel with the solenoid switch, and breaks the circuit through the heater element, and in  
70 a second position completes the circuit through the heater element and breaks said parallel circuit. In manufacture the further switch is placed in the first position, and preferably taped, so that on connecting to the supply, the solenoid valve is initially opened,  
75 causing the container to fill, and the further switch is only then switched into the second position to energise the heating element.

A number of different embodiments of the invention will now be described by way of example with reference to Figs. 1 to 8 of the accompanying schematic drawings in which  
80 *Figure 1* illustrates diagrammatically and not to scale a water heater in accordance with the invention mounted beneath a sink;

*Figure 2* represents a circuit arrangement for controlling a solenoid valve located adjacent the operation of the heater by means of a remotely positioned electric switch;

90 *Figures 3 and 4* show alternative arrangements for actuating a solenoid valve pneumatically and mechanically;

*Figure 5* illustrates part of an arrangement incorporating a mechanically operated on-off valve;

95 *Figures 6 and 7* represent two different methods of control of the valve shown in *Fig. 5*; and

*Figure 8* represents a modified form of the circuit arrangement illustrated in *Fig. 2*.

Referring first to *Fig. 1*, the heater comprises a container 1, conveniently formed of moulded plastics material, having an inlet pipe 2 and an outlet pipe 3 extending through  
105 the base of the container, and a sheathed wire electric immersion heater element 4 of convoluted shape accommodated within the lower part of the container 1 as shown.

The inner end of the inlet pipe terminates beneath the heating element 4, whereas the inner end of the outlet pipe 3 extends nearly to the top of the container. Outside the container the outlet pipe 3 curves upwards and discharges into a sink 5.

110 Control of the flow of water through the container is by means of a solenoid valve 6 fitted to the inlet pipe 2 adjacent the container 1, the valve being controlled by means of a switch 7 of any convenient kind located above the sink adjacent the water outlet.

Referring now to *Fig. 2*, this illustrates the wiring diagram of the heater illustrated in *Fig. 1*, showing the connections to the switch 7 and solenoid valve 6, and to the heating  
125 element 4. A thermostat 8 is connected on the "line" side of the heating element and a thermal fuse 9 in the neutral side, both elements being located, in known manner, within housings carried by the head of the  
130 immersion heater.

Fig. 3 illustrates an arrangement in which the solenoid operating switch 7 is located adjacent the solenoid and is operated by means of a pneumatic switch actuator 10 connected by means of a flexible pipe 11 to an operating button 12, adjacent the water outlet. The switch may be of the spring loaded plunger type in which successive depressions of the plunger produce a closure and opening respectively of the switch contacts, the contacts remaining in the set position until the plunger is again depressed.

Alternatively means may be provided for holding the button 12 itself in the "on" position, until subsequently released.

The pipe 11 may alternatively contain a liquid, the switch 7 then being operated hydraulically.

Fig. 4 illustrates an arrangement in which the solenoid operating switch 7 is a micro-switch which is actuated mechanically by means of a cable 13 connected to a pull-knob 14 located above the sink, and acting on a spring loaded actuator 15, the movement of which operates the microswitch plunger 6.

The solenoid valve may be replaced by a  $\frac{1}{2}$  turn on/off valve 17 as shown in Fig. 5, which valve can similarly be controlled by a pull-cable 18 with spring return or by a push-pull cable. The cable 18 can be operated at the sink top by a pull-knob 19 as in Fig. 6 or a lever 20 as in Fig. 7. Other methods of control may alternatively be used.

It will be observed that where an electrically operated valve 6 is employed as in Fig. 2 the valve can only be opened when the heater 4 is connected to the supply. This can cause problems during installation as it is essential that the container 1 be filled at least above the level of the heating element 4 before the element itself is energised. This can be effected by only making the connections to the heating element after the container has been filled, but this precaution may be overlooked.

Accordingly the circuit preferably incorporates a further switch as at 21 in Fig. 8 which in one position (the "fill" position) completes a current path in parallel with the solenoid valve operating switch 7, at the same time cutting off the supply to the heating element 4, and in a second ("run") position allows current to be supplied to the heating element.

In manufacture, the switch 21 is set to the "fill" position as shown and is taped in that position to prevent accidental changeover or tampering. Then when the heater is installed and is connected to the supply the solenoid valve 6 will be opened and allow the container to fill. During this time the heating element 4 remains de-energised, so that overheating and consequential damage is effectively avoided. Installation instructions include the instruction to remove the tape only after water starts to be fed from the outlet pipe indicating that the container 1 has filled, and

then to change the switch 21 over to the "run" position as shown by the broken line 22. The solenoid will also be de-energised assuming the switch 7 is open, and the flow of water will then stop.

Placing the switch 21 in the "run" position will cause the heater to be energised, and it will then heat the water in the container 1, so that subsequent closure of the solenoid operating switch 7, and the consequent opening of the solenoid valve 6, will result in hot water to be delivered into the sink from the outlet pipe 3.

## CLAIMS

1. An electric water heater of the kind referred to incorporating an on-off valve controlling the passage of water into the container through the inlet pipe, and control means for operating the valve remotely.

2. An electric water heater according to Claim 1 installed beneath a sink and manual control means are provided above the sink.

3. An electric water heater according to Claim 2 wherein the valve is a solenoid valve operable by means of a switch mounted above the sink.

4. An electric water heater according to Claim 2 wherein the valve is a solenoid valve operable by means of a switch located adjacent the valve, the switch operable remotely by said manual control means.

5. An electric water heater according to Claim 4 wherein the switch is operable pneumatically.

6. An electric water heater according to Claim 4 wherein the switch is operable hydraulically.

7. An electric water heater according to Claim 4 wherein the switch is operable by a mechanical linkage.

8. An electric water heater according to Claim 1 or 2 wherein the valve is operable directly by pneumatic, mechanical or hydraulic means.

9. An electric water heater according to any one of Claims 2 to 6 including a further switch which, in one position, completes a current path in parallel with the solenoid switch, and breaks the circuit through the heater element, and in a second position completes the circuit through the heater element and breaks said parallel circuit.

10. The installation of an electric water heater according to Claim 9 in which said further switch is initially held in its first position, so that on connecting the heater to the supply the solenoid valve is initially opened, causing the container to fill, and the further switch is only then switched into the second position to energise the heating element.

11. An electric water heater of the kind referred to for installation beneath a sink, substantially as shown in and as hereinbefore described with reference to any one of the

Figs. 1 to 8 of the accompanying drawings.

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